

## **Claims**

What is claimed is:

1. A flexible connection unit for use in a spinal fixation device, the flexible connection unit comprising a solid metal rod having grooves formed in a spiral configuration along at least a portion of the rod so as to provide flexibility to rod.
2. The flexible connection unit of claim 1 wherein the solid metal rod is made from a material selected from the group consisting of: stainless steel, iron steel, titanium, titanium alloy and NITINOL.
3. The flexible connection unit of claim 1 wherein the rod is cylindrical in shape and has a length between 4 and 8 centimeters and a cylindrical diameter between 4 and 8 millimeters.
4. The flexible connection unit of claim 3 wherein the grooves are cut toward a center longitudinal axis of the rod, the grooves having a depth between 1 and 4 millimeters and a width between 0.1 and 0.5 millimeters.
5. The flexible connection unit of claim 4 wherein the grooves spiral around the rod at an angle  $\theta$  from horizontal between 50 and 80 degrees and wherein the spacing between adjacent spirals of the groove is between 3 and 6 millimeters.
6. The flexible connection unit of claim 1 further including a plurality of transverse tunnels formed within at least a portion of the solid metal rod.
7. The flexible connection unit of claim 6 wherein the solid metal rod is cylindrical in shape and each transverse tunnel passes through a center longitudinal axis of the cylindrical rod such that openings for each respective transverse tunnel are located on opposite sides of the cylindrical wall of the rod.

8. The flexible connection unit of claim 7 wherein each transverse tunnel passes through the center longitudinal axis of the cylindrical rod at a predetermined angle  $\Phi$  and wherein adjacent transverse tunnels share a common opening on one side of the cylindrical wall, forming a zig-zag pattern of interior tunnels passing transversely through the central longitudinal axis of the rod.

9. The flexible connection unit of claim 8 wherein the location of the common openings overlap with the location of the grooves on the exterior surface of the rod.

10. The flexible connection unit of claim 7 wherein each of said plurality of transverse tunnels have an internal diameter between 0.2 and 3 millimeters.

11. A flexible connection unit for use in a spinal fixation device comprising a solid metal rod having a plurality of transverse tunnels formed within at least a portion of the solid metal rod so as to provide flexibility to the rod.

12. The flexible connection unit of claim 11 wherein the solid metal rod is cylindrical in shape and each transverse tunnel passes through a center longitudinal axis of the cylindrical rod such that openings for each respective transverse tunnel are located on opposite sides of the cylindrical wall of the rod.

13. The flexible connection unit of claim 12 wherein each transverse tunnel passes through the center longitudinal axis of the cylindrical rod at a predetermined angle  $\Phi$  and wherein adjacent transverse tunnels share a common opening on one side of the cylindrical wall, forming a zig-zag pattern of interior tunnels passing transversely through the central longitudinal axis of the rod.

14. The flexible connection unit of claim 11 wherein each of said plurality of transverse tunnels have an internal diameter between 0.2 and 3 millimeters.